REBUILDING AGRICULTURAL MARKETS PROGRAM RAMP LIVESTOCK SECTOR IMPACT REPORT

JUNE 2006

**REBUILDING AGRICULTURAL MARKETS PROGRAM
(RAMP)**

**RAMP Impact Assessment # 3
Assistance to the Livestock Sector**

Submitted by:

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Livestock Impact Assessment

ANNEXES

Summary

Livestock husbandry is an integral part of agriculture in Afghanistan, providing livelihoods to 80% of the population and generating substantial revenue from export earnings. Benefits from livestock development in particular accrue to the poor and rural and per-urban women, primarily because they tend to be more associated with livestock production than with crop production. Smallholder livestock production is also more labor intensive than crop production in generating on-farm employment.

As with the livestock sub-sector, the poultry sector is critical for incomes. The major production is free range and traditional in which poultry birds scavenge in backyards for feed. Women almost exclusively deal with village poultry production. The Dutch Committee for Afghanistan (DCA) and the Food and Agriculture Organization of the United Nations (FAO) are the two principal contractors to RAMP's assistance to the livestock and poultry sub-sector activities. Operating in 26 provinces, the DCA provided vaccinations and treatments against diseases in large and small ruminants, equines, camels and poultry. The FAO poultry program worked with village women in seven provinces to increase poultry production through the distribution of pullets, provision of vaccines, training and market organization. An assessment was undertaken to evaluate the economic benefits of the interventions for the period January 2004 to June 2006. The major findings are:

The DCA has provided vaccination to 2.3M cattle and goats and treated/medicated 244,000 equines and camels. On average each cattle and smallstock was vaccinated three times against the most common diseases; equines and camels were treated/medicated at least twice. Assuming a 70% attribution to RAMP, the head value of cattle and smallstock saved is US$153M, and that of equines and camels US$78M. Net productivity gains from cattle and smallstock accounts for US$123M. Measured in terms of traction and transport, productivity gain from equines and camels is US$78M.

The DCA has developed the organizational and human development of Afghanistan's veterinary capability through the establishment of 388 veterinary field units and training of a large number of paravets and basic village workers. 8 cold rooms were installed in 6 provinces to store vaccines. Another 9 cold rooms were installed in 4 provinces to process milk.

In the poultry sector, FAO has distributed over 266,000 pullets against a target of 345,000 to 22,230 women. It has vaccinated 1.6M birds in six provinces, trained 28,000 women, formed over 900 producer groups and 5 feed processing units to support producers in marketing chicken and eggs. Productivity gains from poultry, measured in terms of the value of eggs produced and chicks hatched is valued at, respectively, US$3M and US$22M.

The total gain from the livestock and poultry programs over the period 2004 to 2006 is US$256M. This gives a ROI ratio of 16. This is a significant achievement which can be accredited to RAMP and its implementing partners.

I. The Significance of Livestock in Afghanistan

Livestock husbandry is an integral part of agriculture in Afghanistan, providing livelihoods to 80% of the population. There are two major livestock production systems in the country– semi-nomadic and irrigated sedentary. The semi-nomadic system involves raising livestock on open access grazing lands. The Kuchis, who account for 7 to 10% of the population and depend entirely on livestock, are the inhabitants of Afghanistan's rangelands. Until recently, the Kuchi livestock accounted for a third of the sheep, 39% of the goats, 5% of the cattle, 54% of the horses, 14% of the donkeys, and 63% of the camels in the country (IDEA, 2003)[1]. The remaining livestock population is kept by smallholder farmers under irrigated system where cattle dominate the herd composition. Most sedentary smallholders also keep some equines for farm power and transport.

Prior to the war, the livestock sub-sector accounted for 40% of total export earnings, but over the years this share has shrunk so much that in 2002 export earnings from karakul skins and wool, excluding carpets, accounted no more than 2-5% (Guimbert, n.d.)[2]. Between 1978 and 1990, total output of livestock declined at an average rate of 5.5 percent per year (Ulfat and Iqbal, 2000)[3]. By late 1990s, the livestock population had almost reached the pre-war level and output was on the increase only to be decimated from the drought, disease, crisis sales and low reproduction rates over the past five years (see Figure 1).

Before the war, per capita meat consumption was 11.5kg annually with an average of 4kg per capita for rural and urban poor. Milk consumption was 60kg per capita (Nyrop and Seekins, 1986)[4]. This ratio was reasonably high by most developing countries standard but has fallen since. Statistics are hard to come by, but an indication of the decline is that aggregate milk production from cows and sheep in 2002 was about 964,270 metric ton giving a meager per capita of 36kg[5] and aggregate meat production (including beef and small ruminant meat) was 322,000 metric ton, which on a per caput basis averaged 12kg per annum (Earth Trends, 2003)[6], compared with about 19kg in Pakistan.[7] The low level of milk and meat availability is primarily due to the low level of output which in turn is a consequence of the fall in livestock population and low productivity of animals.

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[1] International Development Economics Associates, 2003 "State of Afghan Agriculture".

[2] Guimbert, Stephane "Structure and Performance of the Afghan Economy", Technical Annex 1 to Chapter 1, World Bank (not dated).

[3] Ulfat-un-Nabi Khan and Muzaffar Iqbal (2000) Role and the Size of Afghanistan Livestock Sector in Afghanistan. World Bank, Islamabad

[4] Nyrop, F. Richard and Seekins, M. Donald (1986) "Afghanistan Country Study'. Foreign Area Studies, The American University, Wisconsin, Washington D.C.

[5] Derived from FAO (2003) "Afghanistan National Livestock Census" and having applied productivity coefficients stipulated in Annex 1E.

[6] http://earthtrends.wri.org/pdf_library/country_profiles/agri_cou_004.pdf

[7] www.pakissan.com/english/allabout/livestock/dairy

Figure 1 Afghanistan, Livestock Population Before and During the Drought
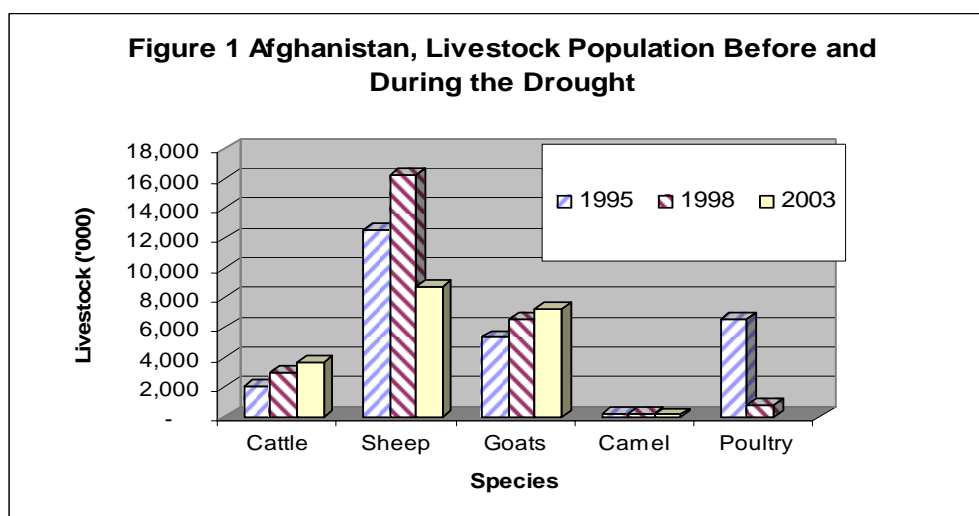
Note: The drought started in the later year of the 1990s, overwhelming the country in 1999 and peaking up in 2002. Source: FAO/WFP 2001, FAO 2003[8].

Livestock offer opportunities to increase incomes and employment. Generally, the income elasticities for livestock products are higher than for cereals. With rapid population growth of about 2.5% per annum and increased urbanization and incomes, demand for livestock products in Afghanistan is likely to grow at a faster rate over the coming years.[9] Mellor (2003)[10] estimates that when incomes grow rapidly, say at 5 percent per capita, the demand for livestock products grows at between 6 and 8 percent per year. And if the livestock sector meets this growth in demand it will double in size every 10 years and its share of agricultural GDP could also be 50%. In effect the agriculture sector will also grow at a much faster rate. The case for promoting increased livestock production is pressing given the growing demand for animal products and a large proportion of the population living in extreme poverty, most of whom are dependent, at least in part, on food and income derived from livestock.[11] Benefits from livestock development will in particular accrue to the poor and rural women, primarily because they tend to be more associated with livestock production than with crop

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[8] FAO/WFP "Crop and Food Supply Assessment Mission to Afghanistan" Special Alert No. 315, 8 June 2001; FAO, 2003 "Afghanistan National Livestock Census 2003" Interim Report.

[9] As domestic production cannot keep pace with demand, growth in consumption of livestock products occurs at the expense of increasing net imports. An indication of this is that between July and August 2002, Afghanistan imported animals worth Rs 30 million (about US$ 5M) from Pakistan. This is to supplement a large yet unrecorded number of animals smuggled through the border www.pakissan.com/english/allabout/livestock/dairy

[10] Mellor, W. John (2003) "Agricultural growth and Poverty Reduction – the rapidly increasing role of smallholder livestock" Key Note Address, International Workshop on Livestock and Livelihoods: Challenges and Opportunities for Asia in the Emerging Market Environment" 10-12 November 2003, Anand, India.

[11] GDP per capita in Afghanistan was growing at annual rate of 20 to 27 percen since 2002. Obviously this level of growth cannot be sustained for long, especially if poppy that powers the economy is eradicated. Nevertheless the underlying assumption would remain the same – that, demand for animal products will continue to increase in the coming years, even if growth falls to a single digit number.

production. Smallholder livestock production is also more labour intensive than crop production in generating on-farm employment.

However, the livestock sub-sector faces immense problems: loss of livestock and lack of restocking support, decreased productivity due to declining feed and overgrazing, and the spread of animal diseases. Much of the irrigated land that supported a large proportion of the livestock is now without water to grow feed. The drought that persisted for five years has decimated about 40 to 60% of the livestock population in the country. The Kuchis apparently suffered the worst loss. Before the drought, a Kuchi family owned on average, about 300 head, of which 83 percent were sheep and 13 percent goats. However, during the drought the Kuchis lost an estimated 80 to 95 percent of their flocks, of which 70 to 80 percent of the losses were due to distress sales at a time when livestock prices were depressed (ICARDA, 2002)[12]. The impact has been severe particularly in the South where most Kuchis lost all their animals and are compelled to work as labourers on agriculture fields. Encroachment into traditional grazing pastures by sedentary farmers and the subsequent clearing of bushes and pastures has further deprived the Kuchis opportunities to rebuild their depleted herd.

There is a burgeoning need for technical assistance, including development of improved, low cost feed, veterinary services, breeding program and restocking if livestock is to play its full role in economic development. Livestock production systems in Afghanistan are traditional and subsistence oriented in which there is minimal management input in terms of breeding, disease control and nutrition. Typically producers follow multiple production objectives that are driven more by their immediate needs rather than the demands of a market. Subsistence production generally follows low-input and risk adverse strategies, and producers strive to maximize total system output. While monetary returns are the driving force in a high-input system like commercial ranches, subsistence requirements and cultural values define subsistence livestock production systems of Afghanistan.

Cattle are important for milk production and cultivation of land. Most farm families keep oxen to cultivate the land but milk production is at the centre of the livestock production systems. Generally milk is not sold in the rural communities. But milk is processed into various products – dry yogurt and cheese - and sold in both rural and urban markets. Cattle are therefore a direct source of food and cash income.

Cattle are rarely slaughtered for domestic consumption. Cattle are slaughtered during specific occasions and functions such as weddings, religious and cultural festivals. Small ruminants and chicken are slaughtered for meat to supplement beef from butcheries for home consumption.

Cattle are also a source of manure. Manure is mainly used as fertilizer by sedentary communities. Agriculturally, given their centrality in nutrient cycling, livestock thus play a vital role in the development of sustainable and environmentally sound mixed crop-livestock farming systems.

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[12] ICARDA, August 2002 "Needs Assessment on Feeds, Livestock and Rangelands in Afghanistan" Draft Report.

Cattle are therefore multipurpose animals, supplying a wide range of outputs to families. Inevitably farmers seek certain genetic traits in the animals (like the potential to survive and reproduce under traditional systems where the environment also posses a major constraint) and maximize the multitude of outputs.

Smallstock have greater adaptability and resilience to dry environments than cattle. They breed fast and are a means of generating cash income as well as a source of meat/milk for direct household consumption. They are a low-cost and inflation-proof alternative saving. Their value provides asset (financing) and security (insurance) benefits at times of difficulty. This explains why smallstock are preferred by Kuchis.

The herd composition typifies the production strategies specified above. Ratios are estimated and presented in a 3x4 contingency table (Table 1). In 1976, there were more goats and sheep than cattle, but fewer sheep than goats. Over the years, the ratio of sheep to goats and cattle has changed drastically. There are still more goats than cattle, but the ratio in 2003 has halved. It seems that at the start of the drought (1998/9) stock keepers retained more sheep and goats and disposed of their cattle. Sheep now outnumber goats and cattle, the latter almost by two-and-half fold. Karakul sheep have received special attention due to Karakul pelts. It was estimated that Karakul sheep breed accounted for a third of the national sheep population before the war (ICARDA, 2002). The population of Karakul sheep had been restored after the war if it was not for the recent drought that drastically reduced the sheep population.

Table 1. Estimated Livestock Ratios for Afghanistan

	1976	1995	1998	2003
Sheep:Goat	0.34	2.33	2.46	1.21
Sheep:Cattle	1.31	6:00	5.40	2.36
Goat:Cattle	3.90	2.57	2.19	1.96

Source: 1976 data from Afghanistan Gazetteer; 1995 and 1998 data from FAO/WFP "Crop and Food Supply Assessment Mission to Afghanistan", 8th June 2001; 2003 data from FAO "Afghanistan National Livestock Census" Interim Report, 2003.

Like the livestock sector, the poultry sector in Afghanistan is also subsistence oriented. In prewar Afghanistan, a few large-scale commercial poultry operations were developed on government farms, but the major production was free range and traditional in which poultry birds scavenged in backyards for feed. The war has seriously disturbed both production systems. The commercial farms have gone, and the traditional system is making a steady recovery. Women almost exclusively deal with village poultry production. It is assumed that since 1996, the number of poultry birds is increasing at a rate of 4 percent per annum with annual production of 5,000 tons of meat and 350 million eggs (Ulfat and Iqbal, 2000). However, demand for poultry products exceeds domestic supply and large quantity of poultry meat and eggs is imported from as far as Brazil. The indigenous breeds have very low production potential with annual mortality of chickens often reaching 65% of the population under the traditional system. The most important constraints to the sector are inadequate technical knowledge of the producers and lack of vaccines for the prevention of diseases, and feed.

II. Intervention Priorities

Prior to the war, the infrastructure for livestock development included facilities for providing in-country veterinary education, a number of veterinary clinics in the major centers, several veterinary pathological laboratories and local production of certain vaccines against major livestock diseases. Much of this infrastructure was unfortunately destroyed during the war. Animal health service has been accorded the highest priority by aid organizations during the war and continued to date. However, coverage is limited, the government veterinary infrastructure is still weak and/or absent in large parts of the country, disease is rampant and farmers need to be convinced of timely vaccinations and treatments. Traditional measures used by farmers, such as spraying, use of herbs for flies and deworming are ineffective in preventing mortalities and outputs from falling[13]. Table 2 lists the most prevalent animal diseases in the country.

Table 2. Common Livestock Diseases and Parasites

	Cattle	Sheep	Goat	Poultry	Equines
Anthrax	xxx	xxx	xxx		
CCPP		xxx	xxx		
Enterotoxamia	xxx	xxx	xxx		xxx
Foot and Mouth	xxx	xxx	xxx		
Black Leg	xxx				
Hemorrhagic Septicemia	xxx				
PPR		xxx	xxx		
Parasites	xxx	xxx	xxx	xxx	xxx
Colic		xxx	xxx		
Pox Disease		xxx	xxx	xxx	
Newcastle Disease				xxx	
Fowl Pox				xxx	
Gumboro				xxx	

Livestock mortality rates act on the present level of output. Mortality rates are high because veterinary services are not available to farmers and Kuchis. Even in areas where there is relatively better knowledge and use of veterinary services, animal mortality is high by most developing countries' standard. Many of the diseases are thought to be controllable, given the right infrastructure and personnel. The Dutch Committee for Afghanistan (DCA) was the principal contractor to RAMP veterinary program. Operating in 4 primary and 26 target provinces,[14] the DCA provided vaccinations against major infectious diseases in large and small ruminants, equines, camels and in poultry. Vaccinations were done regularly against anthrax, blackleg, enterotoxamia, hemorrhagic septicemia for cattle and smallstock, and against Newcastle disease for poultry. In

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[13] As an example, FAO reported that an affluent Kuchi in Herat had 800 sheep and goats and six tents, but his herd produced just 200 lambs because the flock conception rates were down due to anthrax, sheep pox, enterotoxamia and parasites (FAO, 2001) "Crop and Food Supply Assessment Mission to Afghanistan, 8th June, 2001.

[14] The DCA operates in Parwan, Ghazni, Nangarhar, Kunduz and 20 other provinces, except in Bamiyan, Helmand, Laghman, Nuristan, Nimroz, Samangan, Uruzgan, Zabul and Kandahar.

addition, the DCA provided and administered curative treatments against common parasites and certain diseases affecting livestock, including equines.

Besides vaccination and treatment campaigns, the DCA has built local capacities to overcome the constraints posed by shortage of qualified veterinarians. It has established 388 field units, of which 218 were run by DCA itself and the rest by its sub-contractors (PRB 49, AVA 121) and trained 498 paravets and 136 basic veterinary workers (BVWs) to operate in remote villages where veterinary services are unavailable to farmers. The project has also installed 8 cold rooms in 8 provinces to store vaccines and another 9 cold rooms to process milk and derivatives, like butter and cheese.

In the poultry sector, the RAMP program augmented interventions by the UN and NGOs that propagate poultry production and use poultry birds as an instrument for income generation projects. Modelled on the concept of "village poultry production" first developed by FAO in 1999 in Northern Afghanistan, the RAMP poultry program worked with village women to increase poultry production in five target provinces – Parwan, Kunduz, Nangarhar, Ghazni, Baghlan. Vaccinations were also provided to non-project poultry in Hirat while producer groups were established in Bamiyan. The program was carried out by female trainers for village women. It included intensive training of village women, supply of improved chickens, regular vaccination against Newcastle Disease, fowl pox and in some cases gumboro which is common in Kabul, Parwan and Jalalabad and is largely associated with poultry imported from Pakistan, improvement of chicken houses, preparation of mixed feed and marketing of eggs. The project targeted 25,000 women, each received 12 pullets of 6-8 weeks age. Poultry Producers Groups (PPGs) were established for groups of village women to maintain the supply of inputs and to arrange vaccinations. Marketing of eggs is also to be organized through the PPGs.

This impact assessment covers the period January 2004 to June 2006. In the case of the DCA veterinary program, this was a two-and-half years coverage from the contract date; in the case of the FAO poultry program, the coverage was close to three years.

III. Methodology

There is a dearth of reliable data on animal mortality and productivity. Also, the Afghan herd structure is not well established and many of the production parameters are not known or based on rather dated figures. Probable coefficients are computed using information from the literature and by extrapolating from comparable agro-pastoral economies from Sub-Saharan Africa. Some of the coefficients are also derived by manipulating basic data obtained from livestock specialists. The coefficients were discussed with FAO, DCA and RAMP specialists.

3.1   Baseline Data

The basic data for this assessment was compiled from the monthly progress reports submitted by the respective implementing partner. However, the DCA data had many limitations for this assessment. To begin with, the progress data reported to RAMP was in

a highly aggregated form. That is to say, the data did not show the coverage broken down by species; cattle, sheep, goats, equines and camels were all summed together and reported as animals vaccinated/treated. Moreover, upon a closer look at the data and discussion with RAMP specialists, it became clear that the DCA was reporting not the number of animals vaccinated/treated through the veterinary campaign but the number of vaccinations and treatments. It has taken a good deal of data manipulation work to disaggregate this lumpy vaccination/treatment data and establish the actual number of cattle, sheep and goats by province.

The DCA had a cumulative target of 10M vaccinations and 5.5M medications and treatments up to June 2006 (Table 3). On the assumption that 90% of the vaccination target was given to cattle and smallstock, this figure was divided by the average number of vaccines normally administered to cattle and smallstock. Cattle are generally vaccinated against the most common diseases: anthrax, blackleg, hemorrhagic septicemia, and foot-and-mouth. While anthrax is regular and widespread, vaccination against blackleg depends on outbreak of the disease. Foot-and mouth vaccination is also not regular, mainly because the vaccine is not locally available and storage is also a problem. For smallstock, the most common diseases are pest des pititis ruminants, enterotoxamia, sheep pox, and anthrax. These days hemorrhagic septicemia is also administered to sheep and goats. Sheep pox is not endemic; it is seasonal. However, it is not localized; it is countrywide. To derive at the number of animals DCA was targeting in its contractual campaign, the total number of vaccinations given to cattle and smallstock was divided by three.

Table 3. DCA Targets (in Million)

	Jan – Dec 2004	Jan – Dec 2005	Jan – Dec 2006	Total
Vaccination	4.0	4.0	2.0	10
Medication	1.4	1.4	0.7	3.5
Treatment	0.8	0.8	0.4	2.0
Total	6.2	6.2	3.1	

Similarly, the annual vaccination coverage figure has been divided by three to derive at an estimated number of animals vaccinated. This approach was presented to DCA specialists and they concurred.

In the second stage, to establish the baseline data, livestock data from the 2003 and 2004 PRA surveys were reviewed first, but it turned out that the data compiled from these surveys departed by a significant margin from the FAO 2003 livestock census data. For practical reason therefore the FAO census data has been used as a baseline.

In the third stage, the ratio of each species in the total herd for Afghanistan has been determined. To derive at the number of animals planned for vaccination in each province, the ratio of total livestock covered by the DCA veterinary campaign to the total livestock population in the DCA program provinces (target : total herd) was estimated and this

ratio was then multiplied by the number of animals (base year figure). To derive at the actual number of each species vaccinated, first the ratio of DCA coverage to the total target (achievement : target) has been derived and this ratio was multiplied by the livestock number planned for vaccination for each of the four primary provinces and 26 non-primary but target provinces in aggregate. The same procedure was applied to estimate the number of camels, horses and donkeys, the planned targets for treatment/medication and the actual achievement to date.

Medication and treatment figures overlap with vaccination and complicate the estimation. The same animal (cattle, sheep or goat) can have multiple vaccinations, medications and treatments. On the other hand an animal may have just treatment and no vaccination. Often equines and camels are not vaccinated, except on rare occasion against tetanus and rabies. The general practice is to treat equines and camels for digestive disorders due to low quality feed, respiratory diseases caused by bad shelter, and some infectious diseases, worms and colic. It is assumed that 90 percent of the medication/treatment target was meant for cattle and smallstock which are already covered by the vaccination target. Thus, in order to avoid double counting, only the vaccination figures are considered for cattle and smallstock.[15] To derive at the equine and camel population targeted for treatment and medicated, 10 percent of the target was considered, and this figure was divided by two, because each animal is on average treated/medicated twice as suggested by DCA specialists. Of the reported annual treatment/ medicated figures, 10% was again considered for equines and camels and the resulting figure was divided by two. There are proportionally more donkeys than horses (a ratio of 10:1) and more donkeys than camels (a ratio of 9:1).

Intervention in the poultry sub-sector involved both distribution of pullets and vaccination campaigns. The project has distributed more than 266,000 pullets to 22,230 women and provided over 1.6M vaccinations against Newcastle, fowl pox and gumboro diseases. The project has also supported the establishment of 5 feed units against a target of 7 (Table 4).

All pullets were vaccinated against Newcastle disease before distribution. The project also vaccinated poultry owned by households not participating in the program in an effort to avert possible outbreak of disease. On average every chick was vaccinated at least three times in a follow up program. FAO estimates that out of the total vaccinations given so far, about 16% was for poultry birds owned by village households not part of the program. Roughly, this will be about 426,000 birds. This study reports the impact of the veterinary campaign on the poultry population distributed by the program. The impact on the non-program poultry population is not addressed in this impact assessment.

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[15] It is possible that the health and hence productivity of a cattle or a smallstock treated and medicated may increase. But this gain would be insignicant if the animal is not simultaneously vaccinated against the major diseases. The critical input for cattle and smallstock is vaccination.

Table 4. Poultry Project Targets and Performance Indicators

Activity/Performance Indicators	Performance Targets	Cumulative Up to December 2005[16]
No of pullets distributed	345,000	266,771
Parwan		88,261
Kunduz		57,455
Nangarhar		58,020
Ghazni		34,300
Baghlan		28235
No of women trained in poultry management	28,000	28,101
Parwan		6,141
Kunduz		5,340
Nangarhar		5,450
Ghazni		3,767
Baghlan		4,403
Bamiyan		1,002
Hirat		2,000
No. of producer groups established	800	932
Parwan		225
Kunduz		117
Nangarhar		431
Ghazni		35
Baghlan		54
Bamiyan		0
Hirat		70
No. of PG revolving funds established	800	N/A[17]
Parwan		N/A
Kunduz		N/A
Nangarhar		N/A
Other Provinces		N/A
Vaccination programs implemented (Newcastle Disease)	1,000,000	1,566,622
Parwan		472,231
Kunduz		425,103
Nangarhar		312,840
Ghazni		116,180
Baghlan		205,605
Hirat		16,710
Feed processing units established	7	5

Note: PG stands for producer groups

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[16] Except in Nangarhar, there was no distribution of pullets in other provinces in 2006 because of fear of bird flu epidemic. There was no distribution of pullets in Bamiyan and Hirat at all. The vaccination coverage for Hirat is therefore for poultry owned by communities.
[17] Breakdown by province not available.

3.2   Herd Structure

Knowledge of the Afghan herd structure is important to estimate the output values as well as the values of the animals saved by the veterinary program. In the dry environment, smallstock outnumber cattle. In the irrigated livestock system, where cattle also provide draught power, farmers maintain more male cattle than in the open access system. Extrapolating from agro-pastoral systems in Sub-Saharan Africa (FAO, 2002), approximate scenarios were constructed for the Afghan herd structure (see Table 5).

The proportion of smallstock to cattle is high, indicating the herd rebuilding strategy pursued by stock keepers (smallstock breed fast and are the best species for recovery from drought). There are also proportionally more females than males, indicating the priorities producers assign to herd rebuilding and milk-based farming rather than beef. The male to female ratio of 41:59 is similar to that noted in Kenya (Kajiado), Sudan and other Sub-Saharan Africa countries.[18] Also, somewhat similar to the herd structure in East Africa, animals over 3 years of age constitute a considerable proportion in the Afghan herd structure.

Table 5: Percentage of Livestock in Each Category

Cattle			Smallstock			
					Sheep	Goat
Males:		41	Males:		18	18
	Bulls > 3 yrs	7		Rams/bucks	10	7
	Oxen > 2 yrs	22		Lambs/kids	8	11
	Steers 1-3 yrs	7				
	Calves < 1 year	5				
Females:		59	Females:		82	82
	Cows > 3 yrs	36		Ewe/does	60	62
	Heifers 1-3 yrs	15		Lambs/kids	22	20
	Calves <1 year	8				
Total		100			100	100

The percentage of breeding females, 36% for cattle and 60% for sheep and 62% for goats is high and could be due to the importance of milk to farming households. It may also be the result of an attempt by farmers and Kuchis to overcome the limitations imposed on herd growth by high mortalities and low conception rates. Moreover, it is a clear indication of stock keepers desire to rebuild their depleted herd.

The number of adult breeding bulls in the herd gives a mating ratio of 1:5.1. This ratio is higher than for Ethiopian highlands (1:1.97) but close to the migratory (1:5.9) and sedentary (1:6.9) herds in Sudan (Ibid). The Afghan bull:breeding female ratio however compares favourably with the recommended ratio of 1:50 under natural service.

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[18] FAO (2002) "Cattle and Small Ruminant Production Systems in Sub-Saharan Africa, A Systematic Review", Rome; International Livestock Research Centre, Nairobi, "On-farm Phenotypic Characterisation of Kenyan Zebu Cattle".

3.3   Mortality and Morbidity

Some livestock diseases have the potential to depress the overall performance of an animal, while others cause mortality and infertility. Losses due to morbidity as reflected by reduced growth, lactation, work output and reproduction (judged by calving intervals for cows, calving percentage, and delayed maturity, etc) are extremely complex to measure. However, a model can be built to measure the effects of a single disease, say, FMD, to measure the values of output foregone. If one were to measure the reduction in milk output due to FMD, for example, offtake rates can be compared for "with" and "without" situation. A simple model[19] would look like this. If it is assumed that the annual incidence of FMD is 30%, the effects of the disease can be estimated using the following coefficients:

- 1% of the animals affected died
- Cows produced milk for 6 months after calving. If a lactating cow was affected, 20% of the lactation yield was lost

Since the cows are assumed to be in-milk for 6 months, the FMD incidence rate during the lactation period will be half the annual incidence rate, i. e. $0.3/2 = 0.15$

> Mean amount of milk lost per lactation = 450liters/cow x 0.2 x 0.15 = 13.5 liters per cow
> Mean amount of milk without FMD = 450liters/cow + 13.5 = 463.5 liters per cow

The model stipulated above provides a rough approximation of the effect of an individual disease and hence the benefits of a disease control program. However, in a situation where an animal may be infected by multiple diseases, it will be extremely difficult to isolate the effect of each disease and measure its impact separately. Moreover, some of the losses may be due to nutritional and management factors, not just disease. Focusing on a particular disease is likely to result in overestimating its effect. Another limitation of the model is that it requires a thorough knowledge of the actual disease, its magnitude and losses experienced in infected herds. This is a complex task and probably unrealistic. For practical reasons its application is limited for a herd kept in an open access system.

The alternative model used by RAMP looks at the effects of diseases in a provincial herd/flock and computes the direct losses in the absence of a veterinary program. To quantify these losses and hence the benefits of the program, various animal production parameters are compared for two scenarios – with and without veterinary program and the difference is valued to derive the net gain. The following matrix, adapted from Putt, et. al (Ibid) is used to value benefits from improved fertility and reduced mortality.

For a given animal and sex, the values of all production parameters in with and without diseases is calculated to get the net difference in output which is attributed to the DCA

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[19] S.N.H. Putt, A.P.M. Shaw, A.J. Woods, L. Tyler and A.D. James (1988) "Veterinary Epidemiology and Economics in Africa - A Manual for Use in the Design and Appraisal of Livestock Health Policy", University of Reading. Available online.

veterinary campaign. To achieve this, the herd structure ratios (Table 5) are applied to the total herd/flock population to differentiate the number and sex of animals. Annual mortality rates differ between species, and without vaccination and after vaccination. A 2006 study by DCA shows that between 2004 and 2006, mortality rates for calves, decreased from 4.2% to 1.8%, for lambs from 1.8% to 1.8% (unchanged) and kids from 24.3% to 0.9%.[20] This is a very significant improvement. It suggests that there is almost no mortality in calves in 2006. This is very questionable and impossible to say if it is repeated across the country. After all the study uses a very small sample population, 60 farmers, from a specific location which is unlikely to be representative of the country at large.

Rather than use these localized coefficients, the approach adopted in this impact assessment is to apply the coefficients reported by Schreuder et. al. (1996).[21] Based on a survey of four districts carried out by the Dutch Committee for Afghanistan, Schreuder et al. compared average annual mortality rates for livestock in areas covered by veterinary program with areas not covered. These coefficients are used to estimate the growth potential of the herd/flock at different offtake rates for animals covered by the veterinary program. They are more robust and conservative in imputing the benefits of the veterinary program. Given the absence of area specific mortality coefficients no adjustment was made to the mortality rates to capture provincial differences. The mortality coefficients are given in Table 6.

Table 6. Mortality Coefficients for Cattle and Smallstock (in percentage)

Adults	Cattle	Sheep	Goat
Mortality base year	6.5	15.1	13.6
Reduced mortality	3.6	7.2	6.3
Young	Calves	Lambs	Kids
Mortality base year	23.1	31.4	29.5
Reduced mortality	14.5	16.3	17.8

To estimate the number of animals saved, mortality coefficients for two scenarios were applied: without vaccination, and with vaccination. The difference between the two is a net gain for RAMP. To actually value this gain, the proportion of each category of animal in a herd is first derived (e.g. cows, calves, heifers, bulls, oxen, and steers) and multiplied by the average price of the animal. The same estimating technique has been applied to derive the value of sheep and goats as well as transport animals of horses and donkeys saved.

Manipulation of the coefficients given above produces annual approximations about the effect of diseases in depressing production parameters of a growing livestock population. The procedure is repeated for sheep and goats by changing the production parameters. It

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[20] Unpublished survey results by DCA.
[21] Schreuder, B.E.C. et. al. (1995) A Benefit-Cost Analysis of Veterinary Interventions in Afghanistan based on a Livestock Mortality Study. Preventive Veterinary Medicine 26, PP 303-314.

is a crude estimate, compared to herd modeling but nonetheless satisfactory to measure net incremental gains.

Mortality among equines and camels is low. It is assumed to be 2 percent without treatment, falling to 1.5 percent after treatment. The difference between with and without vaccination is a net gain to RAMP. It has not been possible to estimate the gains from improved fertility, because of lack of information about the reproductive potential of equines and camels.

Mortality rate in poultry is high, approaching 65% under traditional system, but with vaccination against Newcastle Disease and improved feed and management of birds, this could be lowered substantially. It is believed that mortality for poultry covered by the FAO program could be 5% (Haroon Nessar, NPPP Poultry Production, FAO, Personal Communication).

The head value of each species is based on farmgate price averaged for the country. Prices are held constant over the entire period. Average prices reflect the prices paid for animals intended for meat, transport and draught as well as the generally higher prices paid for female animals for reproductive purposes in the post-drought period. Prices are variable, depending on location, breed and season. For example, the average price of a *watani* (indigenous) milking cow would be US$300-400 in Kunduz whereas the same animal may fetch US$500 in the South. Equines are used as transport animals and farm power. Horses and donkeys are the commonest equines, but camels are also used in lowland areas to transport heavy goods. In some locations camels are also slaughtered for meat, but only after the animals have aged. Camels are more commonly kept by Kuchis. The average price of a horse in Kunduz is US$400. Northern breed horses, especially those used for the traditional 'sport' – buskashi – are most prized and may cost double this amount. Depending on size and breed, a donkey may cost up to US$45 and a camel about US$600.

Productivity is affected by the basic production parameters of calving rates and mortalities. To estimate productivity gains, production parameters given in Table 7 were applied to animals covered by the veterinary program annually. Calving rates are 80% for cattle and in excess of 100% for sheep and goats. Calving interval for cattle is assumed to be about 16 months. That is to say, cows will give birth only twice between 2004 and 2006. The lambing/kidding rate for sheep and goats is assumed to be annually. The lactation period is variable, depending on weaning ages and genetic traits. It is assumed that the average lactation length would be 6 months for cows and 3 months for smallstock. Milk offtake per lactation (quantity available for human consumption) is generally low, at an average of 450kg/cow (30kg/sheep and goat). Net annual gains (births minus deaths and milk output through reduced mortality) are valued using constant prices. Sheep and goat milk is not sold as such. But value-added products, namely dry yogurt (locally known as qurut) and cheese (paneer) are processed domestically and marketed widely. Hence, the net milk output from sheep and goats from animals saved is converted to dry yogurt and cheese, assuming that 50% of the milk goes to make dry yogurt and the other 50% to make paneer cheese. The conversion ratios are,

9kg of milk = 1kg of cheese; 11kg of milk =1kg of dry yogurt. The output is then valued using the local price of US$1,560/Mt for dry yogurt, and US$2,000/Mt for cheese.

Table 7. Production Parameters of Cattle and Smallstock

		CATTLE		SHEEP		GOAT	
		With	Without	With	Without	With	Without
Adult females	(AF)	36%		60%		62%	
Adult mortality		3.6%	7.2%	7%	15%	6.3%	13.6%
Annual offtake rate		16%	12%	27%	19%	26.5%	16.7%
Calving/lambing/kidding rate	(CR)	80%	65%	113%	108%	133%	121%
Live births	(LB)	(AF*CR*100)/100		(AF*CR*100)/100		(AF*CR*100)/100	
Calf/Lamb/kid mortality	(CM)	15%	23%	16%	31%	17.8%	29.5%
Calf/Lamb/kid survival		LB-CM		LB-CM		LB-CM	
Calves/Lambs/kids valued	(US$/head)	55		35		30	
Milk output/head	Kg/head	450	450	30	21	30	21
Offtake rate adults	Rams/Bucks			27%	19%	30%	25.6%
	Ewes/Does			10%	6%	10%	6%
	Cows	8%	5%				
	Oxen	20%	10%				
	Steers	10%	5%				
	Bulls	10%	10%				

Annual offtake rates are calculated from the net incremental gain of animals saved. Mature animals (oxen and cows) that are expected to be culled and bulls and steers that are not required for the reproduction of the herd and sold are also valued. The offtake for sheep and goats is estimated in the same way: a given ratio of adult sheep and goats saved are culled annually. The output of hides and skins are directly correlated to the animals culled per year.

By products like heads, intestines, liver, lung and heart are edibles and valued, and an average retail price of $10 was assigned for edibles from cattle and $5 from smallstock.

Average wool production per sheep is assumed to be 1.5 kg from two sheerings in a year. Average hair production per goat is assumed as 0.5 kg. It is assumed also that 40% of the smallstock are sheered annually. Cashmere production is of special importance as it fetches good price in the international market. Cashmere production is assumed to be 5 percent of the total hair production.

Traction and transport are the two most important values of work animals. Oxen, the group of equines and in some cases camels are the most important species used for work. Traction constitutes a multitude of activities. By convention the major value of animal traction is seen as a general increase in farm capacity. The introduction of a pair of draught oxen is generally believed to increase the cultivation capacity of a family

engaged in traditional agriculture by a factor of 2 or 3 (Jahnke, 1989)[22]. But there appears no way of driving from this a generaliseable value of animal traction. An indirect method is to value draught power using the average rental rate for farm work. It is believed that much of the 3.5M hectare rainfed land in Afghanistan is ploughed with oxen and the average time of their use as draught animals can be assumed to be 90 days in a year (Ulfat and Iqbal 2000).[23] A pair of oxen could plough one jerib (one-fifth of a hectare) in a day and the average rental rate would be US$3-5 per day. The productivity gain from oxen saved through vaccination is thus derived by applying a daily rental rate of US$4 to the total number of oxen saved.

Productivity gains from equines and camels are measured for their transport. Horses and donkeys are sometimes used for draught power in mountainous areas but more commonly as transport animals and the average time of their use as transport is assumed to be 60 days/year for donkeys and 45 days/year for horses and camels. Information obtained from DCA specialists suggests that the daily rental rate for a cart horse in Kunduz less feed cost is US$4 and for a donkey US$3. This rate is applied to the number of animals saved to derive at productivity gains from equines covered by the veterinary program. Camels are rarely used for transport, except as beast of burden when Kuchis move from one location to another.

For poultry, it is assumed that 5% of the pullets are cocks, 50% are hens laying eggs and each hen lays150 eggs/year falling by 10% annually. But because the pullets are young they lay eggs for about eight months, and about 25% of the eggs will be hatched for multiplication of which 95% will survive.

IV. Results

The total number of cattle and smallstock (head count) targeted by DCA in its three year veterinary project was 2.3M, and of equines and camels 244,000. These targets were fully met by DCA through the veterinary campaign with most animals vaccinated, treated and medicated at least twice. In the poultry sector, the project has distributed over 266,000 pullets against a target of 345,000 to about 22,230 women and provided over 1.6M vaccinations against Newcastle and other known diseases in six provinces. Through the distribution of pullets, the project has achieved 77% coverage and established 932 producer groups (116% achievement) against planned targets over the "life of the project.

Net benefits from improved fertility - births, milk from animals saved - and reduced mortality - head gains and increased offtake) are summed annually to value the impact of the veterinary project implemented in 33 provinces. Annex 1A to 1E provides the results of the computation for each province by species. Benefits are derived incrementally on an annual basis. For cattle covered in the first year veterinary campaign (2004), both fertility

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[22] Jahnke, H.E. (1989) Livestock Production Systems and Livestock Development in Tropical Africa. Kiel, Germany, Wissenschaftsverlag Vauk

[23] This value appears to be higher than what was recorded for certain African countries. Use of draught power in the lowland mixed systems of Sub-Saharan Africa ranges from 12 days/year in Burkina Faso to 55 days in Zimbabwe, 60 days in Tanzania and 62 days in Mozambique (FAO, 2002)

and morbidity gains are derived and valued. Animals alive by the close of the year (less post-vaccination death and offtake) are carried forward to the next year and again to the third year. In this case fertility related benefits are claimed for two out of three years because of longer calving intervals for cattle. For new cattle brought into the veterinary campaign in 2005 and 2006, benefits from improved fertility are claimed for one year while the net head gains from reduced mortality are valued annually.

For smallstock, both fertility and morbidity related gains are valued on an annual basis as their calving interval is much shorter than cattle.

Productivity gains from equines and camels are also valued on an annual basis. These gains are derived from the demand for their work on farms and for transport rather than from improved fertility, mainly because the reproductive parameter of these animals is not known. The "active" work days annually is estimated to be 60 days for donkeys and 45 days for horses and camels.

Benefits from the poultry project are valued in the same way as with smallstock. The eggs produced and the chicks hatched annually are valued to derive net productivity gains. The hens surviving in the first year are carried forward to the second and again to the third year. By the end of the third year they have matured and will be sold for meat.

In terms of attribution it has been assumed that 100% of the gains from poultry and 70% from livestock be assigned to RAMP. This is presumed to be a realistic share to RAMP as some NGOs also provide veterinary services in areas covered by DCA (David Sherman, DCA Chief of Party, personal communication).

Summing up the value of animals saved and the productivity gains, interventions in the livestock and poultry sub-sector have resulted in a total impact of US$256M over a three year period. This gives a ROI ratio of 16 against US$15.6M cost. A summary is given in Table 8. A breakout by livestock category and type of value gain is presented in Figure 2. About 80% of the gain is due to improved productivity, 60% of which is from cattle and smallstock. Reduction in mortality accounts for 20% of the total gain. In terms of species, impact from cattle and smallstock accounts for 60% of the total gain, equines and camels for 30% and poultry for about 10%.

Table 8. Livestock Impact Summary, US$[24]

| Provinces | Cattle and Smallstock Net Gain | | Equine Net Gain | | Poultry Net Gain | | TOTAL IMPACT |
	Head Value	Productivity Gain	Head Value	Productivity Gain	Head Value	Productivity Gain	
Ghazni	798,724	4,572,334	4,973	2,705,740	2,550,031	231,351	10,863,152
Parwan	2,200,005	4,304,075	5,027	2,716,579	7,388,227	600,436	17,214,349
Kunduz	1,182,429	6,655,197	37,510	6,426,972	5,562,888	390,041	20,255,037
Nangarhar	1,604,561	13,600,058	10,893	4,405,496	5,088,824	343,731	25,053,563
Other	24,562,730	94,259,061	122,091	61,515,023	-	-	180,458,904
Baghlan					1,297,213	1,409,633	2,706,846
TOTAL	30,348,450	123,390,725	180,493	77,769,810	21,887,183	2,975,191	256,551,851

[24] Based on 70% attribution from cattle, smallstock, equines and camels; 100% attribution from poultry.

Figure 2 Livestock Value Gain
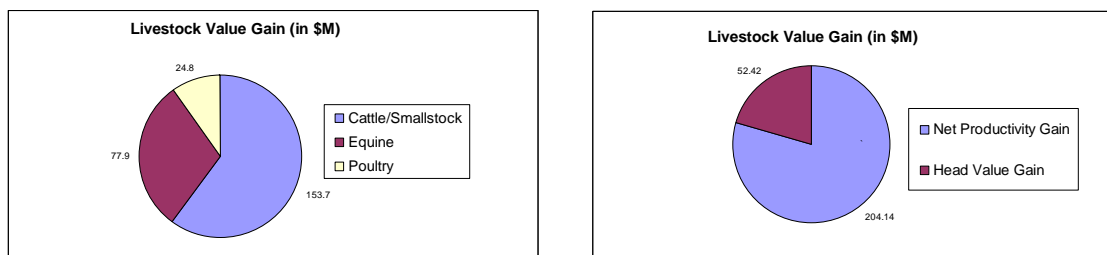
V. Conclusion

The veterinary and poultry projects implemented by DCA and FAO have been a tremendous success. A large number of animals in 30 provinces which otherwise would have died for lack of even basic treatments were saved. Animal productivity has also improved because of improved fertility. Human capacity development of the Ministry of Agriculture Veterinary Department has also been at the core of the project objective. Through the formation of various institutions like BVW, VFU and poultry producer groups, capacities have been enhanced for an effective livestock and poultry program in Afghanistan. The primary benefit of the veterinary project is a sustainable improvement in the livelihoods of stock and poultry keepers across the country, many of whom are women and some of whom are landless. Among sedentary communities, livestock integrate with and complement crop production, embody savings and provide a reserve against risks. Some of the benefits are likely to be reflected in improved nutrition. Increases in offtake will go some way in meeting part of the growing demand for animal products in Afghanistan, particularly for meat and milk. Increases in domestic production and supply of livestock products may result in falling producer prices. These will benefit consumers and accelerate the growth in demand. However, the fall in price is unlikely to be large enough to cancel out the benefits to producers of the increase in productivity. Given current developments is the country - rapid population growth, urbanization and income growth - future prospects will be increasing meat consumption.

The other significant benefit of the improvement in fertility and reduction in mortality will be the substitution of domestic products for imports. Afghanistan imports live animals for meat from Pakistan and various livestock products from the Gulf countries. This effect will bring additional benefits to the country by saving scare foreign exchange. This calls for a continued improvement in production and health aspects of livestock that have bearing upon fertility and productivity.